Title :DARK MATTER AND FOSSIL RADIATION (Tully-Fisher's law and Opera's experiment)

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Abstract:

The idea of the existence of ether has been abandoned after the theory of relativity was accepted. It appears that the existence of an ether, compatible with the classical standard Cosmological model, permits to solve some enigmas of the present Cosmological model that are very important, for instance the enigma connected to dark matter or to fossil radiation. In this article we show how the existence of ether, being compatible with the classical standard Cosmological model, permits to solve those enigmas. In particular how it can give the nature of dark matter, the origin of its invisibility, the curve of velocities of stars in galaxies (constant) and the baryonic Tully-Fisher's law.

Key words: Tully-Fisher's law, dark matter, fossil radiation, Opera's experiment, ether.

1.INTRODUCTION

Before the theory of Relativity be accepted, the idea of the existence of an Ether was admitted. It was admitted that a medium at rest filled all the space, in which propagated electromagnetic waves, and defining an absolute Referential.

After the Michelson and Morley experiment, Einstein proposed the following Principle of Special Relativity: "All the physical laws have the same expression in all the inertial frames (Galilean Referentials)."

If this Principle was true, then the existence of an ether seems to be useless, because we cannot detect it.

In fact we are going to see how the existence of ether is fundamental in Cosmology, and moreover how some observations in Cosmology connected to fossil radiation contradict the Principle of Special Relativity.

So we admit all the cosmological standard model, in particular the following fundamental points:

1.The Universe is isotropic and in expansion.
2.The factor of expansion is obtained using the equations of General Relativity.
3. The Big-Bang existed, and fossil radiation comes from the Big-Bang.

We will also make 2 fundamental hypothesis expressing the existence of ether:

A.At any point of the space, it exists an absolute Referential, called "Ether".
B.The vacuum is filled by a substance, called "ether-substance".

We see that the points 1,2,3 of classical Cosmology (and experiments connected to Relativity) are a priori compatible with the hypothesis A,B of the existence of Ether. We see also that there are 2 kinds of ether: The 1st kind is an absolute Referential, the 2nd kind is a substance filling all the vacuum.

We are going to show how those hypothesis A and B permit to solve enigmas connected to dark matter and to fossil radiation.

2. DARK MATTER

2.1 Nature of Dark matter-Its invisibility.

If we admit that the ether-substance has a mass, then it is clear that dark matter could be constituted of ether-substance. So this gives the nature of dark matter and the origin of its invisibility, because it constitutes what we call the vacuum.

2.2 Curves of velocity of stars in galaxies.

If we model the ether-substance as an ideal gas, and if we consider that galaxies are concentrations of ether-substance, we obtain that the velocity of stars is independent of their distance to the center, this constituting an enigma of classical Cosmological standard model.

So we make the following hypothesis that the ether-substance can be modeled as an ideal gas:

An element of Ether-substance with a mass m, a volume V, a pressure P and a temperature T verifies the law, k_0 being a constant:

$$PV=k_0mT \qquad (1)$$

Which means, setting $k_1=k_0T$:

$$PV=k_1m \qquad (2)$$

Or equivalently, ρ being the density of the element:

$$P=k_1\rho \qquad (3a)$$

We then emitted the hypothesis that a galaxy could be modeled as a concentration of Ether-substance presenting a spherical symmetry, at a constant and homogeneous temperature T.
We then considered the sphere S(r) (resp.the sphere S(r+dr)) that is the sphere inside the concentration of Ether-substance with a radius r (resp. r+dr) and whose the center is the center O of the galaxy. S(O,r) is the full sphere of radius r and of center O.

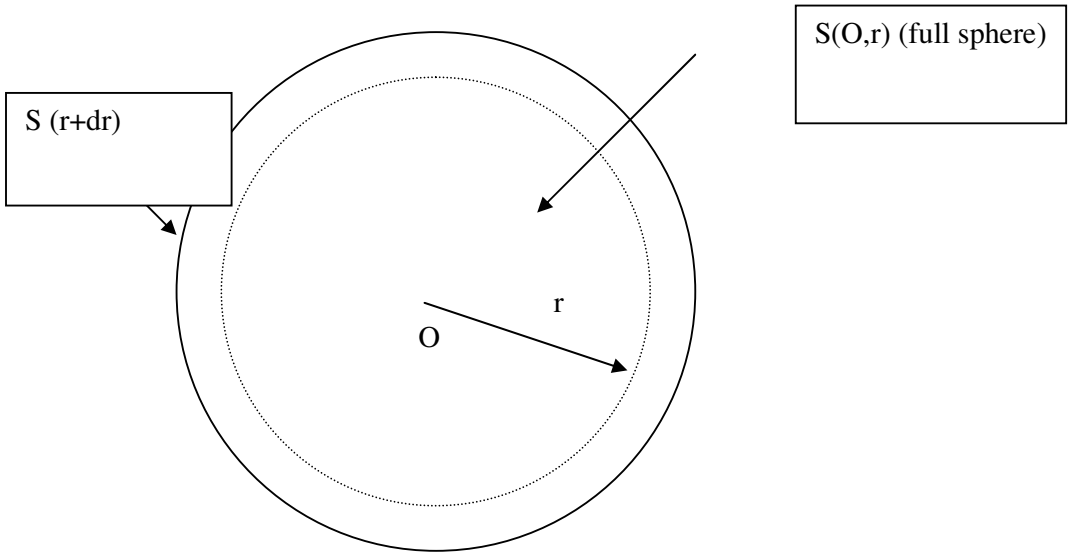

Figure 1:The galaxy concentration of ether-substance

The mass M(r) of the full sphere is given by:

$$M(r) = \int_0^r \rho(x) 4\pi x^2 dx \qquad (3b)$$

We then consider the following equation (4) of equilibrium of forces on an element of Ether-substance with a surface dS, a width dr, situated between the 2 spheres S(O,r) and S(r+dr):

$$dSP(r+dr) + \frac{G}{r^2}(\rho(r) dS dr)(\int_0^r \rho(x) 4\pi x^2 dx) - dSP(r) = 0 \qquad (4)$$

Eliminating dS, we obtain the equation:

$$\frac{dP}{dr} = -\frac{G}{r^2}(\rho(r))(\int_0^r \rho(x) 4\pi x^2 dx) \qquad (5)$$

And using the equation (3), we obtain the equation:

$$k_1 \frac{d\rho}{dr} = -\frac{G}{r^2}(\rho(r))(\int_0^r \rho(x) 4\pi x^2 dx) \qquad (6)$$

We then verify that the density of the ether-substance ρ(r) satisfying the preceding equation of equilibrium is:

$$\rho(r) = \frac{k_2}{4\pi r^2} \qquad (7)$$

The constant k_2 being given by, G being the Universal attraction gravitational constant:

$$k_2 = \frac{2k_1}{G} = \frac{2k_0 T}{G} \qquad (8)$$

Using the preceding equation (7), we obtain that the mass M(r) of the sphere S(O,r) constituted of Ether-substance is given by the equation:

$$M(r) = \int_0^r 4\pi x^2 \rho(x) dx = k_2 r \quad (9)$$

We then obtain, neglecting the mass of stars in the galaxy, that the velocity v(r) of a star of a galaxy situated at a distance r from the center O of the galaxy is given by $v(r)^2/r = GM(r)/r^2$ and consequently :

$$v(r)^2 = Gk_2 = 2k_1 = 2k_0 T \qquad (10)$$

So we obtain in the previous equation (10) that the velocity of a star in a galaxy is independent of its distance to the center O of the galaxy, solving the 3rd enigma concerning dark matter. (We previously solved the enigma of the nature of dark matter and of its invisibility).

We note that the theoretical elements of the new Cosmology permitting to obtain the equations (7)(8)(9)(10) are compatible with Special and General Relativity Principles.

2.3 Tully-Fisher's law.

2.3.1 Recall.

We remind that the Tully-Fisher's law is the following:
Tully and Fisher realized some observations on spiral galaxies. They obtain that the luminosity L of a spiral galaxy is proportional to the 4^{th} power of the velocity v of stars in this galaxy. So we have the Tully-Fisher's law for spiral galaxies, K_1 being a constant:

$$L=K_1v^4 \qquad (11)$$

But the baryonic mass M of a spiral galaxy is proportional to its luminosity. So we have also the law for a spiral galaxy, K_2 being a constant:

$$M=K_2v^4 \qquad (12)$$

This 2^{nd} form of Tully-Fisher's law is known as the *baryonic Tully-Fisher's law*.

We remind that the Tully-Fisher's law (11) is not verified in general for galaxies that are not spiral galaxies. But the observations of Mc Gaugh [(1)] show that the baryonic Tully-Fisher's law (12) seems to be true for all galaxies. This constitutes a new major enigma for the classical Cosmology, but we are going to see how we can derivate this law from the existence of ether-substance.

2.3.2 Theory of quantified loss of calorific energy (by baryons).

We saw in the previous equation (10) that according to the new Cosmology, the square of the velocity of stars in a galaxy is proportional to the temperature of the concentration of Ether-substance constituting this galaxy. So if we determine this temperature T, we then obtain the squared velocity of the stars in this galaxy. So we need to try to determine T:
-A first possible idea is that the temperature T is the so called "Temperature of the fossil radiation". But this is impossible because it would imply that all stars of all galaxies are driven with the same velocity and we know that it is not the case.
-A second possible idea is that the temperature T is due to the absorption by the concentration of Ether-substance constituting the galaxy of a fraction of the photons emitted by the stars of this galaxy. But if it was the case, the temperature and consequently the velocity of the stars of the galaxy would only depend on the luminosity of the galaxy, and we should have a law analogous to the Law of Tully-Fisher (11) and we know that it is not the case.
-A third possible idea is that in any galaxy, each baryon interacts with the Ether-substance constituting the galaxy, and consequently it occurs for each baryon a loss of calorific energy communicated to the Ether-substance.
A priori we could expect that this loss of calorific energy for each baryon (transmitted to the Ether-substance) depend on the temperature of this baryon, but if it was the case, the total calorific loss for all baryons would be extremely difficult to calculate and moreover we would not obtain that the total calorific loss depend on the baryonic mass of the galaxy.

The final idea is that indeed it occurs a calorific loss for each baryon (transmitted to the Ether-substance), but that this loss is quantified, depending only on the number of the nucleons of the baryon. This loss should be very low, but the calorific capacity of the Ether-

substance being also very low, it can involve an appreciable temperature of the concentration of Ether- substance constituting the galaxy.
So we make the following hypothesis:

HYPOTHESIS OF QUANTIFIED CALORIFIC LOSS (OF BARYONS):

-Each baryon of a galaxy is submitted to a loss of calorific energy, transmitted to the concentration of Ether-substance constituting the galaxy.
-This loss of calorific energy depends only on the number of nucleons constituting the baryon (It is independent of its temperature). So if p is the power corresponding to the loss of calorific energy for a baryon with n nucleons, it exists a constant p_0 (loss of calorific energy per nucleon) such that:

$$p=np_0 \qquad (13)$$

According to the equation (13), the total power corresponding to the loss of calorific energy by all the baryons of a galaxy is proportional to the number of nucleons of the whole of those baryons, and consequently to the baryonic mass of this galaxy. So if m_0 is the mass of one nucleon, M being the baryonic mass of the galaxy, we obtain according to the equation (13) that the total power P_r corresponding to the calorific energy received by the concentration of Ether-substance constituting the galaxy from all the baryons is given by the following equation, K_3 being the constant p_0/m_0:

$$P_r=(M/m_0)p_0=K_3M \qquad (14)$$

Concerning the preceding Hypothesis of quantified loss of calorific energy, it is important to remark:
-The loss of calorific energy of a baryon transmitted to the Ether-substance is a quantum phenomenon, consequently it is not surprising that the power corresponding to the loss of calorific energy of a baryon be quantified.
-In physics of thermal transfer, the calorific loss of one or several other particles usually depend on their temperature. But it is always only thermal transfers from baryons to other baryons that are considered, and consequently it is not compulsory that it be also the case for transfers between baryons and Ether-substance.
-It is possible that this hypothesis be true only for baryons whose temperature be superior to a given temperature T_S. Moreover, their temperature must be superior to the local temperature of the Ether-substance.
-The great simplicity of this hypothesis permits to obtain very easily the total power corresponding to calorific energy received by the concentration of Ether-substance (Equation (14)). If the loss of energy of a baryon depended on its temperature, then it would be incomparably more complicated, and maybe impossible, to obtain a simple expression giving this total power.
-This hypothesis is a priori compatible with the Special and General Relativity Principles, and also with classical Quantum Physics.

2.3.3 Obtainment of the baryonic Tully-Fisher's law.

In agreement with the previous model of galaxy, we model a galaxy as a concentration of Ether-substance presenting a spherical symmetry (and consequently being itself a sphere),

at a temperature T and immerged inside a medium constituted of Ether-substance at a temperature T_0 and with a density ρ_0.

In order to obtain the radius R of the concentration of Ether-substance constituting the galaxy, it is logical to make the hypothesis of the continuity of $\rho(r)$: R is the radius for which the density $\rho(r)$ of the concentration of Ether-substance is equal to ρ_0. So we have the equation:

$$\rho(R)=\rho_0 \qquad (15)$$

Consequently we have according to the equations (7) and (8):

$$\frac{k_2}{4\pi R^2}=\rho_0 \qquad (16)$$

$$\frac{2k_0T}{G}\times\frac{1}{4\pi R^2}=\rho_0 \qquad (17)$$

So we obtain that the radius R of the concentration of Ether-substance constituting the galaxy is given approximately by the equation:

$$R=(\frac{2k_0T}{4\pi G\rho_0})^{1/2}=K_4T^{1/2} \qquad (18)$$

The constant K_4 being given by :

$$K_4=(\frac{2k_0}{4\pi G\rho_0})^{1/2} \qquad (19)$$

We can then consider that the sphere with a radius R of Ether-substance constituting the galaxy is in thermal interaction with the medium at a temperature T_0 in which it is immerged. We model this thermal interaction as a convection phenomenon. If φ is the thermal flow of energy on the borders of the sphere, the power P_l lost by the sphere of Ether-substance constituting the galaxy is given by the equation:

$$P_l=4\pi R^2\varphi \qquad (20)$$

But we know that for a convection phenomenon between a medium at a temperature T and a medium at a temperature T_0 the flow φ between the 2 media is classically given by the expression, h being a constant depending only on ρ_0:

$$\varphi=h(T-T_0) \qquad (21)$$

Consequently the total power lost by the concentration of Eher-substance is:

$$P_l=4\pi R^2h(T-T_0) \qquad (22)$$

We can consider that at the equilibrium, the thermal power P_r received by the concentration of Ether-substance constituting the galaxy is equal to the thermal power P_l lost

by this concentration. Consequently according to the equations (14) and (22), M being the baryonic mass of the galaxy, we have:

$K_3M=4\pi R^2h(T-T_0)$ (23)

Using then the equation (18) :

$K_3M=4\pi K_4^2hT(T-T_0)$ (24)

Making the approximation $T_0<<T$:

$$M = 4\pi \frac{K_4^2}{K_3} hT^2 \qquad (25)$$

Consequently we obtain the expression of T, defining the constant K_5 :

$$T = (\frac{K_3}{4\pi K_4^2 h})^{1/2} M^{1/2} = K_5 M^{1/2} \qquad (26)$$

And then according to the equation (10) :

$v^2=2k_0T=2k_0K_5M^{1/2}$ (27)

So :

$$M = (\frac{1}{2k_0 K_5})^2 v^4 \qquad (28)$$

So we finally obtain :

$M=K_6v^4$ (29)

The constant K_6 being defined by:

$$K_6 = (\frac{1}{2k_0 K_5})^2 = \frac{4\pi K_4^2 h}{4k_0^2 K_3}$$

$$K_6 = \frac{4\pi h}{4k_0^2 K_3} \times \frac{2k_0}{4\pi G\rho_0}$$

$$K_6 = \frac{m_0 h}{2k_0 G\rho_0 p_0} \qquad (30)$$

So we obtain the baryonic Tully-Fisher's law (12), with $K_2=K_6$. It is natural to assume that h depends on ρ_0. The simplest expression of h is $h=C\rho_0$, C being a constant. With this relation, K_6 is independent of ρ_0, and we can use the baryonic Tully-Fisher's law in order to define candles used to evaluate distances in the Universe.

2.4 Temperature of the ether-substance.

So we saw that in our interpretation of dark matter, according to the equation (10), the temperature of the ether-substance constituting a galaxy is proportional to the squared velocity of the stars in this galaxy.
We have seen that this temperature could not be the temperature of fossil radiation, because it would then imply that the velocity be always the same.
We could also suppose that this temperature is superior to the temperature of fossil radiation, considering that this temperature of fossil radiation is the temperature T_0 used in equation (21), but then we find a new problem:
According to observation, the velocities of stars for different galaxies can vary with a factor 10. This implies that the temperature of galaxies vary with a factor 100. Consequently if in the equation (21) T_0 was the temperature of fossil radiation (2,73 °K), the temperature of some galaxies should be more than 300°K, which seems to be impossible.
So we have 2 possible explanations C and D:
C.The thermal transfer from the ether-substance towards baryons is nil or negligible.
D.The temperature T_0 in equation (21) is far less than the temperature of fossil radiation.

The hypothesis D. is possible considering that the ether-substance does not interact with fossil radiation. It is also possible that the hypothesis D. be the only one true.

3.FOSSIL RADIATION

We know that fossil radiation is quasi isotropic in a Referential that is not interpreted in classical Cosmology. If an absolute Referential exists (Hypothesis A), then it is natural to assume that it is the Referential in which fossil radiation is quasi isotropic.

More precisely we know that in classical Cosmology we have the following fluctuations of temperature:

$$(\frac{\Delta T}{T}) = \frac{1}{4\pi}\sum_l l(2l+1)C_l \qquad (30)$$

In the previous expression l=1 is the dipole contribution, corresponding to the motion of our Referential linked to the earth relative to a particular Referential. Considering that this particular Referential is the Ether (absolute Referential) defines completely this Referential, that has none particular meaning in the classical Cosmology.

We also remark that if we consider the law:

"The fossil radiation is isotropic in the Referential R",

we know that this physical law is true for only one Referential, which contradicts the Principle of Special Relativity and is in agreement with the hypothesis A of the existence of Ether.

4.DISCUSSION

So we see that the existence of Ether as defined in the hypothesis A and B appears to be fundamental in order to interpret fossil radiation and the dark matter. It is very remarkable that this existence of ether is compatible with the classical standard model of Cosmology. In fact it is possible to develop a very complete Cosmological theory based completely on the existence of Ether, as we did in the articles [(2)] to [(7)]. But this completely new Cosmology is incompatible with the classical Cosmological model, and it is very likely that it brings to

some contradictions. This Cosmology exclusively based on a theory of ether presents great simplifications compared with the classical standard Cosmological model. We remark that our interpretation of dark matter as being ether-substance is compatible with Special and General Relativity, but that Special Relativity appears to be contradicted by the observation of a Referential in which fossil radiation is quasi isotropic. In fact we established a complete Theory of Ether connected to the field of Special Relativity admitting the existence of an absolute Referential in the articles [5] [7]. This should permit to interpret Opera's experiment if it is confirmed [8]. The enigmatic dark energy could be the thermodynamic energy of the ether-substance.

5.CONCLUSION

So we saw how the existence of an ether, as being both a substance and an absolute Referential compatible with the classical Cosmological standard model, permitted to interpret fundamental phenomena connected to dark matter and to fossil radiation. In particular we successfully interpreted the nature of dark matter, the origin of its invisibility, the curve of velocities of stars in galaxies, the baryonic Tully-Fisher's law and the Referential is which fossil radiation is isotropic. We also saw that our interpretation should permit to interpret the Opera's experiment if it is confirmed.

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